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UNIVERSITY OF ILLINOIS BULLETIN

ISSUED WEEKLY

VOL. XXVI

MARCH 12, 1929

No. 28

[Entered as second-class matter December 11, 1912, at the post office at Urbana, Illinois, under the Act of August 24, 1912. Acceptance for mailing at the special rate of postage provided for in section 1103, Act of October 3, 1917, authorized July 31, 1918.]

EDUCATIONAL RESEARCH CIRCULAR No. 51

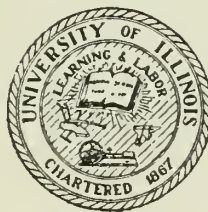
BUREAU OF EDUCATIONAL RESEARCH
COLLEGE OF EDUCATION

THE COMPARISON OF PUPILS' ACHIEVEMENT WITH THEIR CAPACITY

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PUBLISHED BY THE UNIVERSITY OF ILLINOIS
URBANA

THE COMPARISON OF PUPILS' ACHIEVEMENT WITH THEIR CAPACITY

Introduction. For the first few years after the beginning of the standardized-test movement, it was the common practice to interpret scores made on achievement or subject-matter tests without reference to intelligence or other possible factors that should have been considered. Occasionally an unusually thoughtful worker suggested that achievement scores should be compared with chronological ages, mental ages or other measures of general intelligence, or perhaps something else; but it was not until about ten years ago that any specific measures to be used for comparing achievement with capacity were suggested. About 1920, the educational quotient, the subject quotient, and the achievement or accomplishment quotient were proposed, and almost immediately began to receive widespread use. Since then, quite a number of other measures of the same sort have been proposed. Moreover, the great majority of persons who have made use of any of these measures have done so non-critically, paying no, or practically no, attention to their validity and reliability. Only a few persons more critical than most have suggested, and in some cases given evidence to support their suggestions, that these measures do not deserve the high degree of confidence that has been placed in them.

Recommendations as to terminology and practice. On the basis of a careful study of practically all written discussions of this topic, and also of his own experience with measurement, the writer wishes to make the following recommendations. For comparing achievement in a single subject with capacity or, in other words, for subject age (S.A.) divided by chronological age (C.A.), "subject quotient" (S.Q.) should be used. If several subjects instead of one are concerned, "educational quotient" (E.Q.), which equals educational age (E.A.) divided by chronological age, is the most suitable term. "Achievement quotient" or "accomplishment quotient" (A.Q.) is best limited to the comparison of achievement with intelligence; that is, to achievement or accomplishment age (A.A.) divided by mental age (M.A.). Of the other quotient, ratio, and difference measures suggested, none appear to merit acceptance for ordinary school use except perhaps Symonds' "index of effort." It is intended for use in high school and above, since satisfactory age norms to form the basis of

achievement quotients are not there available. The simplest method of computing it is merely to rank the pupils in any particular class or group according to their intelligence and also according to their achievement and find the difference in ranks.

The validity of measures which compare achievement with capacity. It has been shown by several investigators that, from the statistical standpoint, the achievement quotient and most other commonly-used measures of this sort lack validity. The chief reason for this is that the two quantities that are used as the numerator and denominator of the fraction from which a quotient is obtained are not expressed in units of the same size, and therefore are not truly comparable. At least two suggestions as to how to remedy this defect have been made, but both involve enough computation that they can hardly be expected to receive general use.

The reliability of measures that compare achievement with capacity. The data presented in several studies of this point, among which is one made by the writer, indicate that the achievement quotient and other measures which compare achievement with capacity, are not at all highly reliable. For quotients computed from some of the best available standardized achievement tests, the unreliability is so great that if the quotients that would result from a second application of the same test are predicted from its first application, the predictions will almost certainly be more than half pure guesses. For some of the most widely-used tests, they will be from four-fifths to nine-tenths pure guesses. Expressing the same fact in another way, the average errors in such quotients are likely to run about ten per cent of the quotients themselves. Therefore, achievement quotients are in most cases too unreliable to form a satisfactory basis of individual diagnosis, classification, or other procedure. If quotients are based upon average results from several good tests, they may be reliable enough to justify their use. Moreover, the average quotients for classes or larger groups of pupils are usually reliable enough that considerable confidence can be placed in them.

The foregoing discussion is a brief summary of "A Critical Study of Measures of Achievement Relative to Capacity," which is being published as Bulletin No. 45 of the Bureau of Educational Research, University of Illinois. It is not being sent to the complete mailing list of the Bureau, but a copy will be sent free of charge to anyone who requests it.

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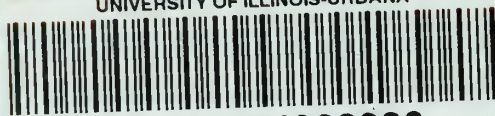
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